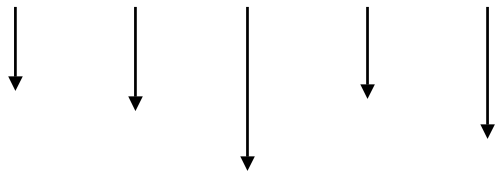
Barriers

- Co-ordinate the flow of control of the participating processes.
- When a process reaches a barrier it must wait there until all the other participating processes have also reached the barrier.
- They may then all continue execution.

Lecture 14

Using Modula-P to control parallelism, mutual exclusion, synchronisation, data partitioning.

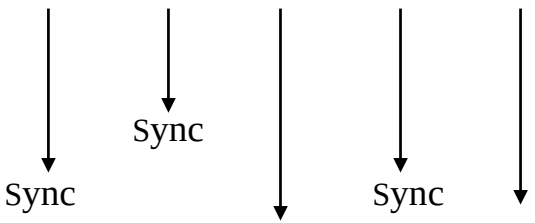
Visualisation



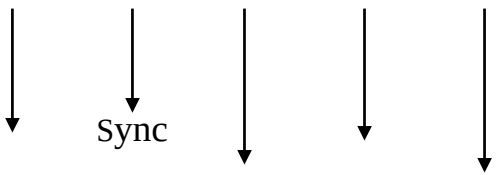
Synchronsation

- There are many types of synchronisation
  - barriers
  - semaphores
  - conditional critical regions
- All these methods control access to data, and consequently control the order and manner in which shared data items can be accessed.

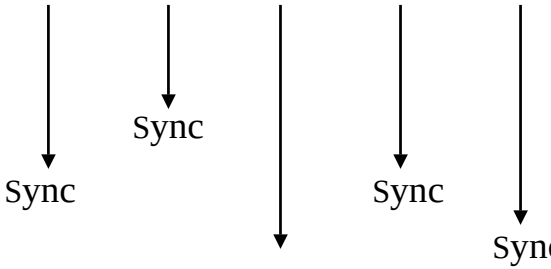
Visualisation



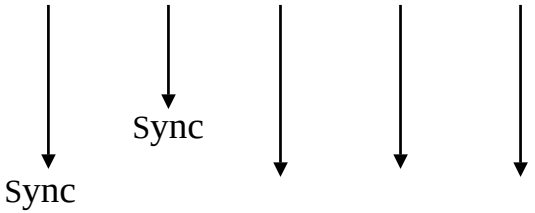
Visualisation



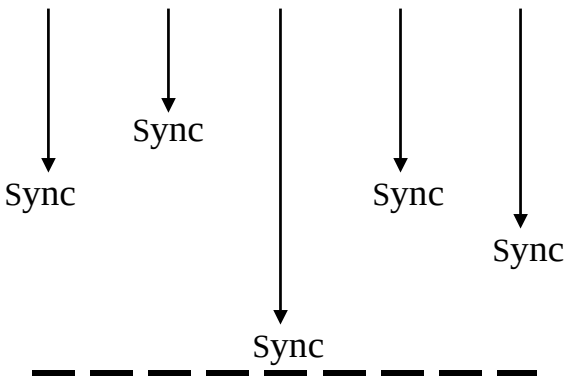
Visualisation



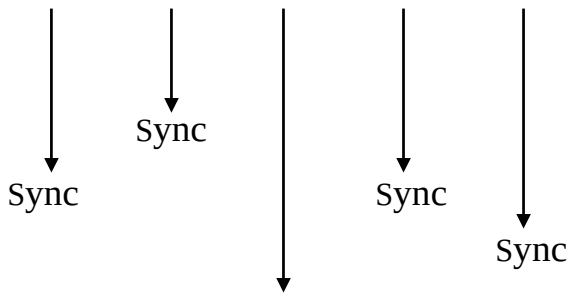
Visualisation



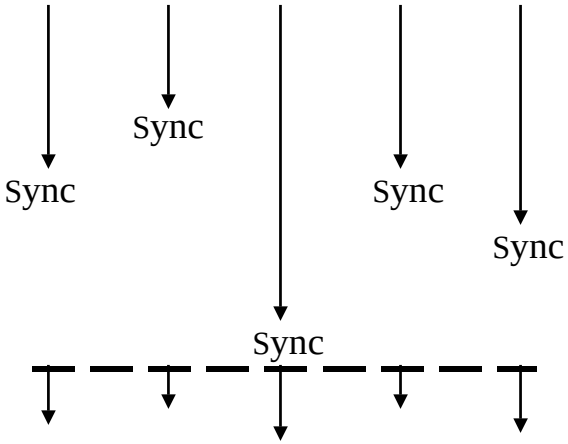
Visualisation



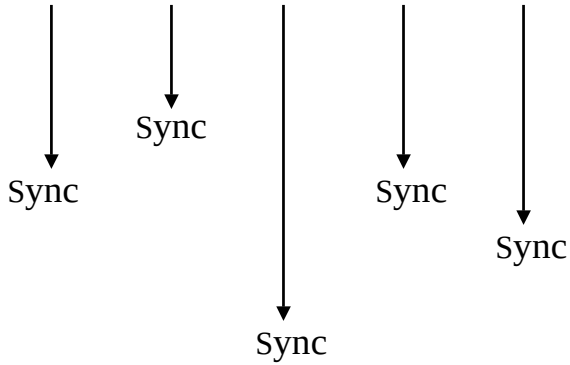
Visualisation



Visualisation



Visualisation



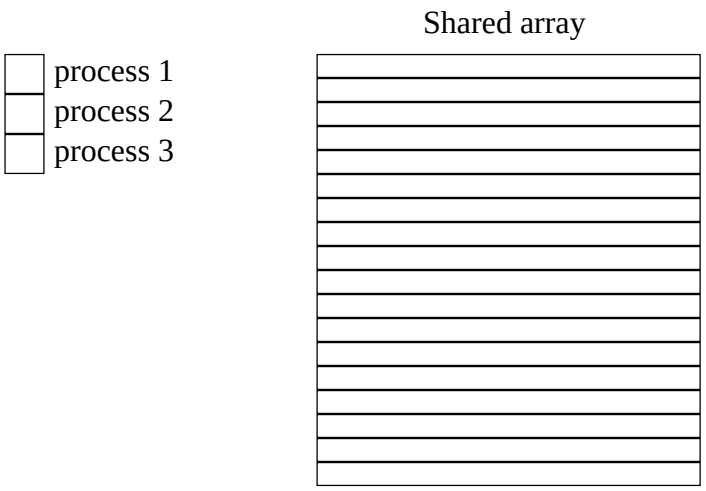
Data partitioning

- A method of allocating sections of data to the collaborating processes.
- The principal objective is to prevent concurrent updates occuring to the same addresses in shared data structures.
- To do this programmers separate/partition data structures among the co-operating processes as a part of the program design.

Critical regions

- A critical region controls access to shared data.
- Only one process can have access to the shared data at a time.
- Access to the data can be controlled by boolean tests on condition variables.

Some partitioning schemes



Critical regions in Modula-P

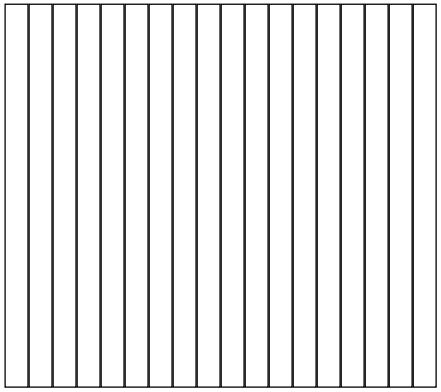
- Update a global maximum.

```
WITH Max WHEN Max < Tmp DO
  Max:= Tmp;
END;
```

Some partitioning schemes

Shared array

process 1
process 2
process 3



Some partitioning schemes

Shared array

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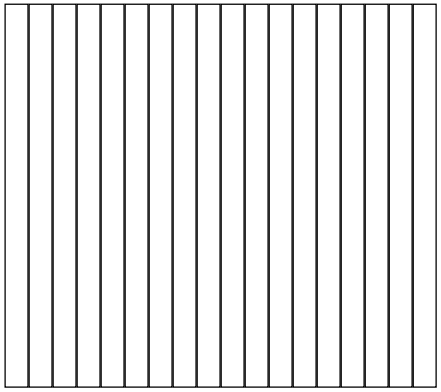
process 2
process 3



Some partitioning schemes

Shared array

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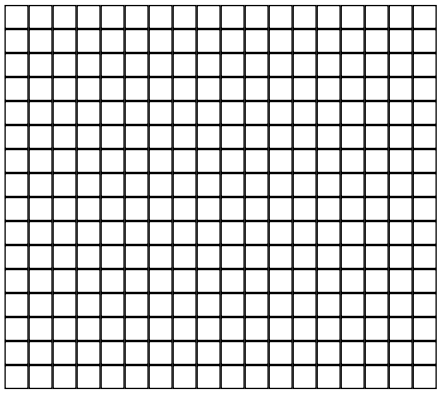
process 2
process 3



Some partitioning schemes

Shared array

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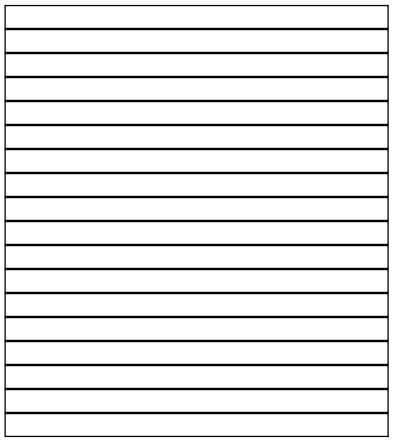
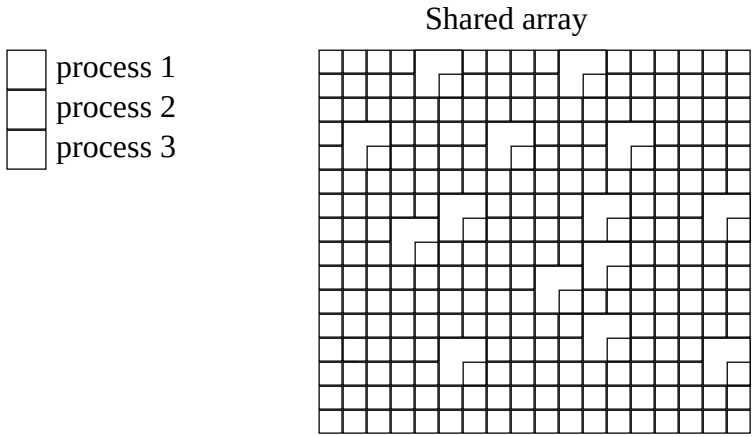
process 2
process 3



Some partitioning schemes